ENVIRONMENTAL
Fact Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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WMD-SW-5 1999

Landfill Closure

Background

In New Hampshire there are over 450 solid waste facilities that are in various stages of operation and/or closure. Approximately fourteen of these are active unlined municipal solid waste (MSW) landfills that may pose a threat to groundwater, are nearing capacity, and therefore must be closed. There are also five double-lined MSW landfills with leachate collection systems, as well as two double-lined landfills with leachate collection systems that receive other wastes (e.g. MSW incinerator ash). Over 180 unlined landfills have discontinued receiving MSW (although some remain active disposal sites for other wastes such as construction and demolition debris) and many sites have been partially closed. Approximately forty unlined landfills that received MSW have been closed in accordance with current Department of Environmental Services (DES) closure requirements.

There is an urgent need for New Hampshire communities to properly close out all unlined landfills as soon as possible. This should be done to prevent further health risks and environmental damage and to avoid the enormous expense of cleaning up seriously contaminated sites, and further, to assess and remediate through proper closure techniques, any adverse environmental impacts caused by past disposal practices.

Environmental Concerns

Proper closure of solid waste landfills is important for long-term environmental protection. The infiltration of rainfall through an unlined, improperly capped landfill, as well as potential movement of groundwater through the landfill, produces leachate which can adversely affect groundwater and surface water quality. Closure plans are developed and implemented, in part, as a means of minimizing leachate production. Typically, this is accomplished by "capping" the refuse mass to promote the run-off of precipitation (versus infiltration) and, in some cases, re-engineering the facility to eliminate groundwater-to-refuse contact zones.

Another concern that creates the need for proper facility closure is that of gas production from within the landfill. Bacterial decomposition of landfilled refuse results in the formation of carbon dioxide and methane. These gases are lighter than air and will travel through void spaces in permeable soils. Nearby buildings may be affected if conditions are conducive to the migration of gases through soil into basements. Once a landfill has been capped with relatively impermeable material, the gases have a tendency to accumulate, ultimately migrating as pressures build. At the time of capping, gas vents are installed through the cap to release carbon dioxide and methane, and to limit lateral migration of gas. For small landfills, passive venting is generally sufficient to cause gases to be released to the atmosphere for dispersion. For larger

landfills, gas vents may be flared to actively burn off the gases, or the gases may be recovered through a collection system to fuel electric generating or steam producing facilities see ***fact sheet WMD-SW-10*** for guidance on managing gas emissions at municipal solid waste landfills.

Closure Requirements

DES requires that a hydrogeological study be performed as a preliminary step to closure. The results of the study determine the impact of the landfill on surface water and groundwater quality. Depending on the severity of the environmental impact and potential effects on human health, the necessary performance standards of the capping system can be determined.

Current closure standards generally require that landfills be capped with an impermeable barrier which consists of a minimum 40 mil geomembrane or a low permeability soil, or admixture. Although certain clays may meet the performance criteria, their availability in New Hampshire is limited; this results in the frequent choice of geomembrane materials for the cap. When a landfill is closed with an impermeable cap, the waste is typically covered with twelve inches of soil over which an additional twelve inches of sand is placed. The impermeable cap is then placed and covered with eighteen inches of specified free draining sand and sometimes Geonet for protection. Finally, a layer of no less than four inches of topsoil is placed and seeded to establish vegetative growth to prevent erosion. A low permeability moisture retention layer is often incorporated beneath the topsoil to aid in vegetative growth erosion resistance.

While the use of impermeable caps is generally required, DES recognizes that the environmental impact of some landfills may not immediately warrant installation of such a cap. After review of the hydrogeological data, DES may grant approval for a low permeability cap at some landfill sites with the use of a low permeability till soil with permeability no greater than 1 x 10 (-5) cm/sec. This cap would not incorporate an impermeable cap but would adequately mitigate environmental problems and meet the intent of the final closure systems using soil materials.

Once installed, the effect of the low permeability cap on groundwater and surface water quality is monitored through the Groundwater Permit system. If at any time the cap is found to be inadequate in controlling the landfill's releases to the environment, or if the landfill is out of compliance with state regulations, DES will require final closure of the landfill with an impermeable cap and/or will implement other steps to ensure remediation of the site.

Closure Costs

Based on MSW landfills with approved closure plans at this time, costs associated with closure construction have been found to range from $50,000 to $100,000 per acre. These costs do not include the engineering service fees for developing the closure plan or post-closure monitoring and maintenance costs during the thirty year monitoring period. The Department has estimated that the cost to close the publicly owned MSWLF's in the state, by the year 2010, will be approximately $290-$300 million. Therefore, the state has established a number of programs to assist the municipalities of New Hampshire in meeting their landfill closure responsibilities. These financial aid programs include a Landfill Closure Grant Program, the State Revolving Fund Loan Program, and a State Guaranteed Bond Program. These programs are briefly described below.

The State Landfill Closure Grant Program (Ch. 307)

The state landfill closure grant program (Ch. 307) will provide 20 percent of the eligible *capital* costs of landfill closure. The eligible capital costs of landfill closure include the costs of hydrogeological and engineering investigation and design, the construction of closure elements required by rules adopted pursuant to RSA 149, and construction supervision. Eligible costs will ***not*** include land acquisition (except for land which is necessary to the physical elements of closure of an unlined landfill) or any administrative, legal and fiscal costs related to the closure.

The Department of Environmental Services Waste Management Division (WMD) has developed the rules and application forms to be used in applying for the state landfill closure grants. It is also important to note that the annual priority for funding established by the law is highest for those projects that are at the most advanced stages of the landfill closure process. As is done in the wastewater grant program, a "priority list" system, including an annual public hearing, is used to determine the priority of funding.

All the publicly owned unlined landfills of the State are eligible, including the public share of those landfills on the Superfund National Priorities List (NPL). The Landfill Closure Grant Program also provides reimbursement for landfill closure projects completed between state Fiscal Year 1985 and state Fiscal Year 1995.

The State Revolving Fund Loan Program

The New Hampshire Department of Environmental Services has expanded the use of the State Revolving Fund (SRF) Loan Program for landfill closure projects in New Hampshire. This program will provide low interest loans for all the eligible capital costs of landfill closure including studies, engineering design and construction. Twenty-five communities have already expressed interest in using the SRF loan program for landfill closure and $27.3 million has been loaned to date for landfill closure projects in New Hampshire. All New Hampshire communities have been encouraged to apply.

State Guaranteed Bond Program for Landfill Closure

The State of New Hampshire has established a $30 million state guaranteed landfill closure bond program to enable towns to benefit from the state's lower interest rates. Four communities have received loans totaling nearly six million dollars to date.

Federal Solid Waste Regulations

In October 1991 the United States Environmental Protection Agency (USEPA) published new regulations concerning the design, operation and closure of existing and future municipal solid waste landfills. These regulations are known as Subtitle D of the Resource Conservation and Recovery Act (RCRA), and progressively take effect over a period of several years.

On February 14, 1994, USEPA made the determination that the New Hampshire *Solid Waste Rules* satisfy the standards and requirements of Subtitle D and New Hampshire became a "delegated state." That is, compliance with the New Hampshire regulations is considered to be compliance with Subtitle D. In the case of unlined landfills, compliance can only be achieved by closing the landfill. Owners and operators of unlined landfills should consult with the Department in the preparation of a compliance schedule for implementing closure.

Guidance Document Available

A DES guidance document provides an explanation of the landfill closure process. The *Guidance Document for the Closure of Solid Waste Landfills in New Hampshire* is available for a nominal fee and may be ordered by calling DES Public Information and Permitting Office at (603) 271-2975.

For more information, contact:

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